202 Review

Review

Sample types

Experiment example

Experiment

- Qualitative – observational, no statistics
  - Group discussions
  - Interviews
  - Small sample size
- Quantitative – experimental, run statistics
  - Need at least two conditions, one *experimental* condition and one *control* condition
  - Large sample size

Experiment

- Between subject comparison
  - Two separate groups for the control and experimental conditions
    - Ex: Group A gets a new medicine, group B gets a placebo
- Within subject comparison
  - Same subjects participate in both conditions
    - Ex: Each participant takes a memory test underwater and in a classroom

Experiment Tips

- Your experimental and control conditions should be as close as possible
  - Only difference is something that answers your question
  - Ex: ideal medical trial
    - Twins, give one drug and other placebo

Experiment Tips

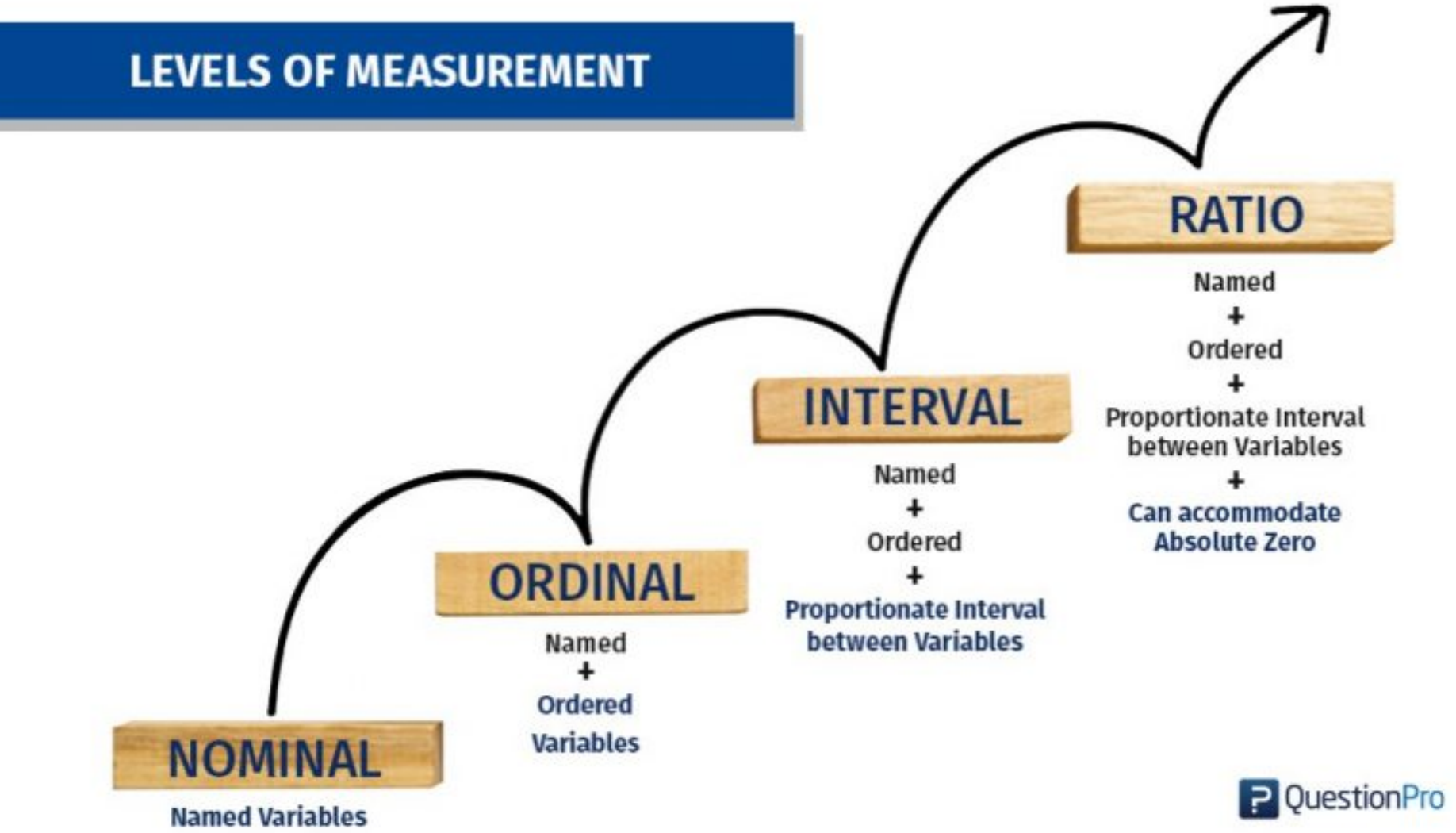
- Observer-expectancy effect
  - Researcher's bias influences the participants in the study
- Double blind
  - Both experimenter and subject don't know which condition a participant is in
  - Avoids experimenter bias

Operational definition

Specifying how variable(s) will be observed and/or measured in a study

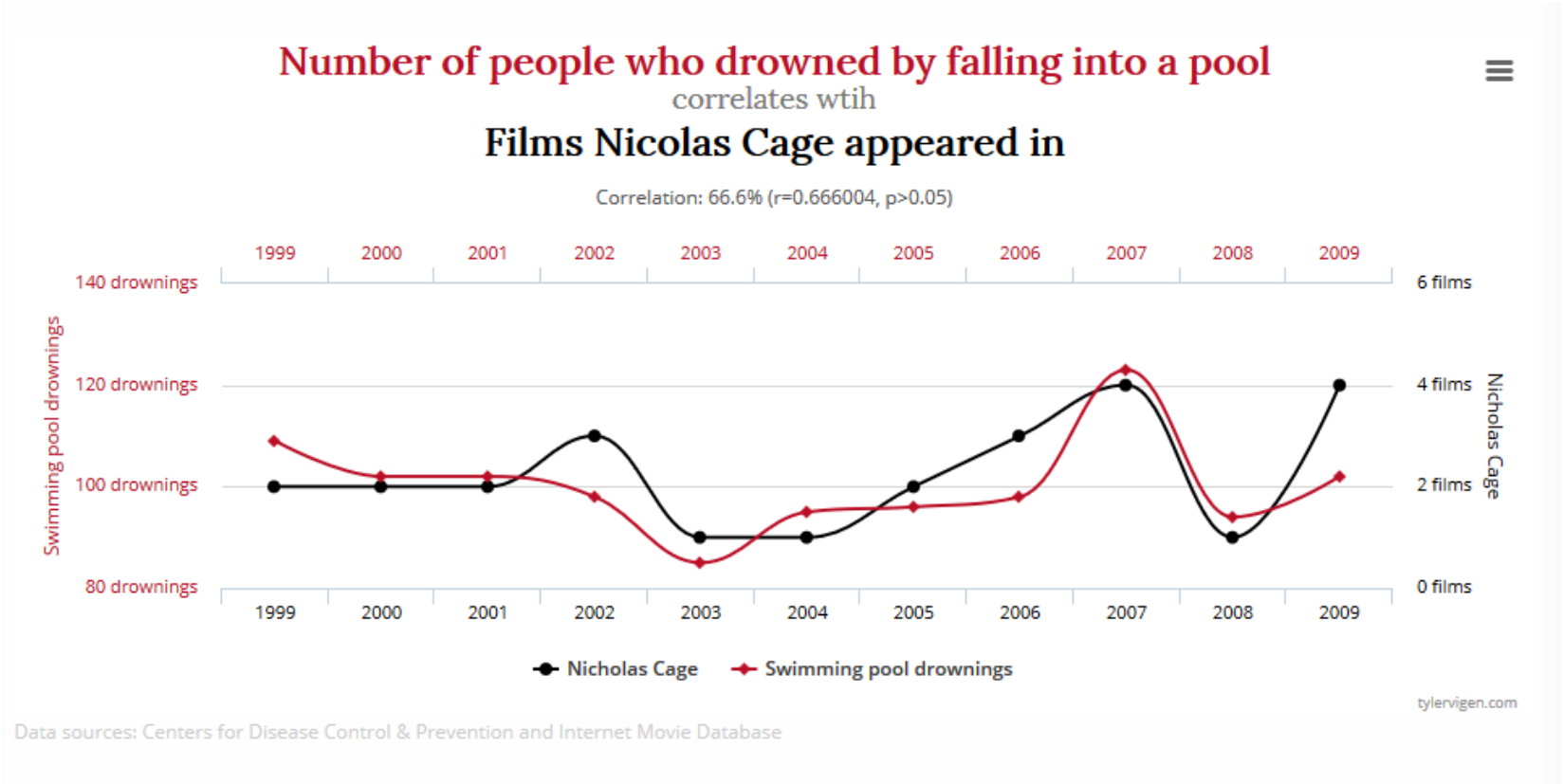
- Cognitive performance
  - Reaction time in ms to respond to stimulus
  - Accuracy
- Stress
  - Self report questionnaire, BP, cortisol
- Weight
  - Wt. in lb. using a spring scale with participants fully undressed after 10 hrs. of fasting

Types of Variables



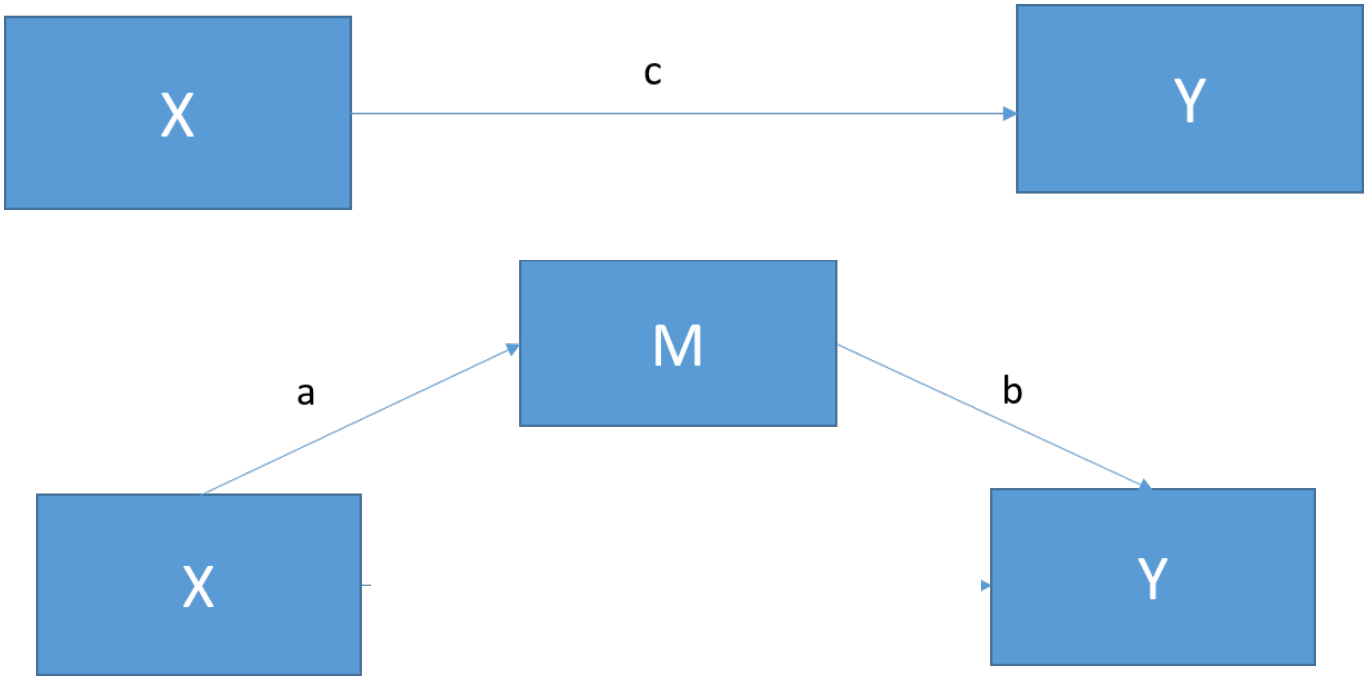
Cognitive neuroscience methods

- Correlation versus causation



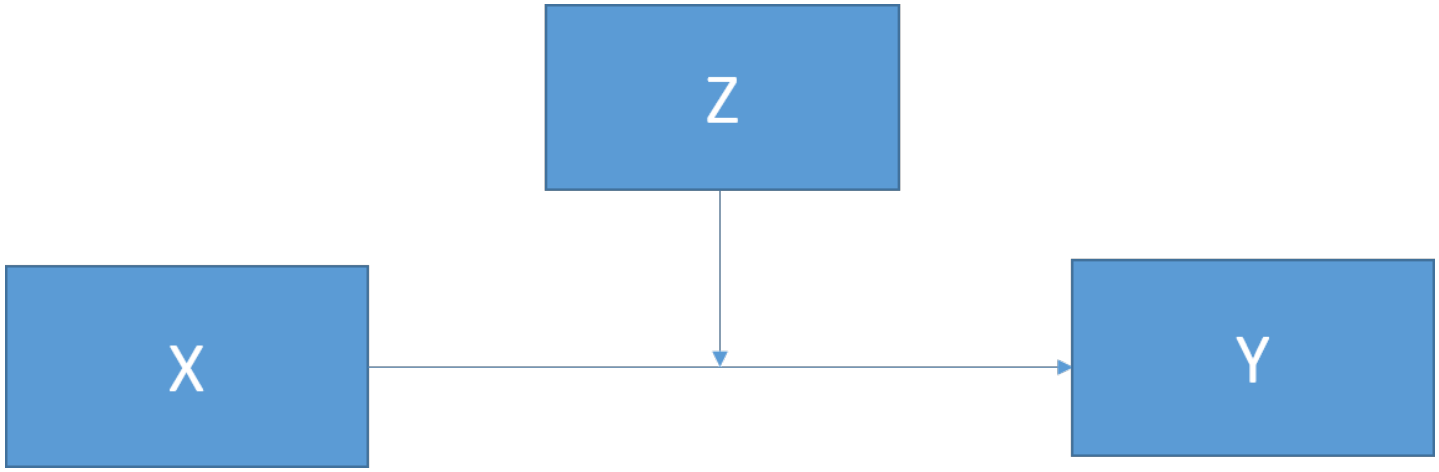
Do Nicolas cage movies *cause* swimming pool drownings?

Mediation



- Mediation – how/why a relationship exists.
  - Mediator is the causal result of X (IV) and causal antecedent of Y (DV)
  - Example:
  - X – grades
  - Y – happiness
  - M – self-esteem

Moderation



- Moderation – affects the relationship itself
  - NOT the causal result of X
  - Example:
  - X – amount of time studying
  - Y – grades
  - Z – grade level (elementary or college)

Quantitative vs. Qualitative Research

- Naturalistic observation
  - Participation and concealment
  - Limits
    - Difficult
    - Lack of control

- How does occupation change decision making strategies?

Descriptive Statistics and Levels of Measurement

Nominal

- Percentages
- Counts
- Mode
- Bar Graph
- Chi-Square (X^2)

Interval/ratio

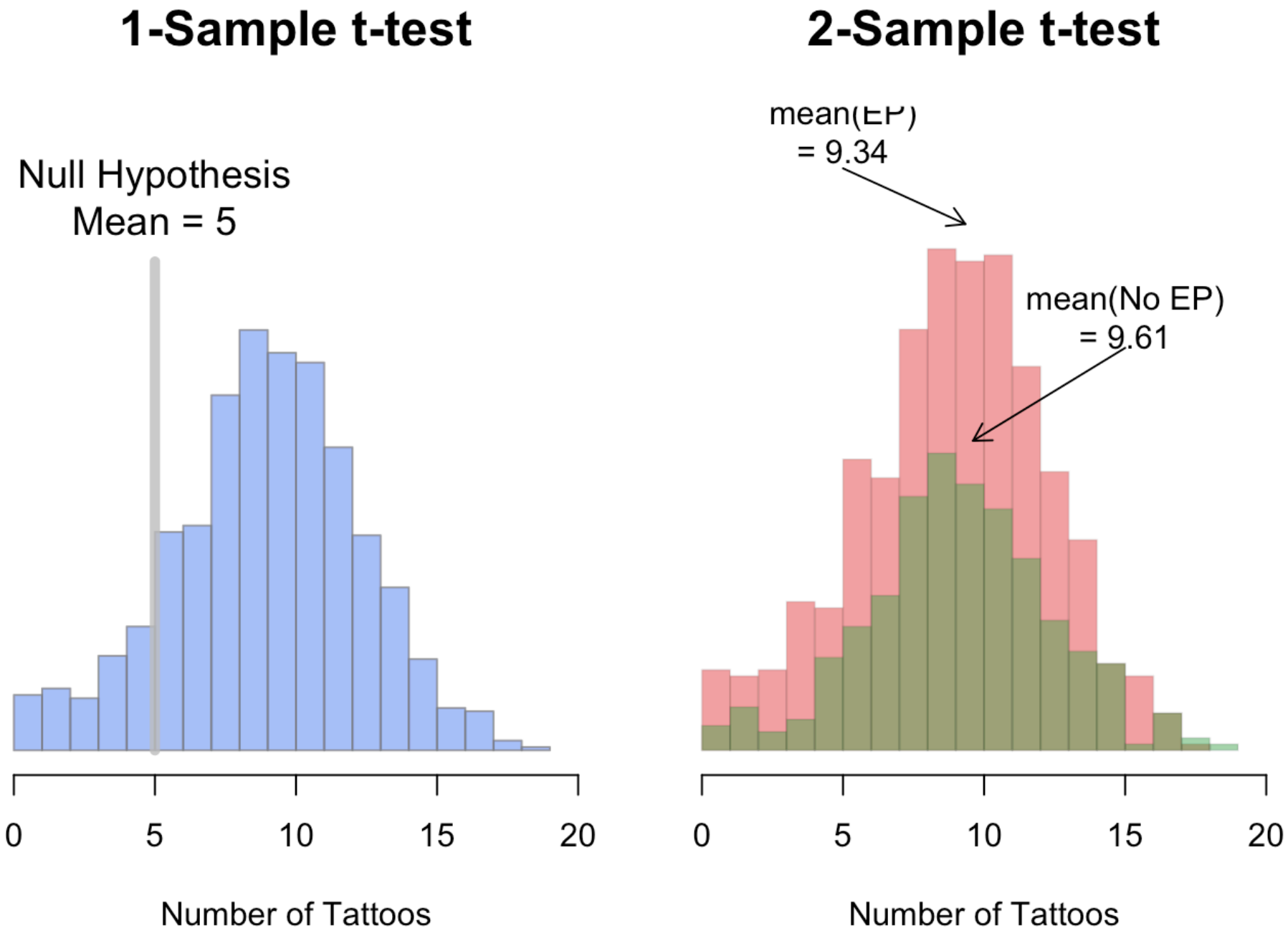
- Mean
- Median
- Mode
- Variability (SD)
- Frequency distributions (tables and graphs)

T-test: comparing means

- Interval and ratio data

- Three main types of t-test:

1. One sample t-test
   - Compare one mean to chance level
2. Independent samples t-test
   - Compare means of two *separate* groups (between group comparison)
3. Paired samples t-test
   - Compare means within the same group (within group comparison)


1-Sample t-test
Null Hypothesis
Mean = 5
0
5
10
15
20
Number of Tattoos
2-Sample t-test
mean(EP)
= 9.34
mean(No EP)
= 9.61
0
5
10
15
20
Number of Tattoos

Multiple Variables w/in a single group

- Two variables—Correlation
  - Direction
  - Degree
  - Shape (linear vs. other)
- Pearson Product Moment
  - $r = .31$, $n = 50$, $p < .05$
  - Bidirectional (iv ∫ dv)
- Restriction of Range

Effect size

- The strength of association between variables
- Pearson *r* correlation coefficient
- Effect sizes
  - Small ~ .15
  - Medium ~ .30
  - Large ~ .40
- r^2 or percent of shared variance between two variables

Multiple Variables w/in a single group

- Simple Regression
  - Y = a + bX
  - where a = intercept; b = slope
- Multiple Regression
  - Y = a + bX + bX + bX …..
  - *R* R^2 beta

Qualitative Research

- Systematic observation in *naturalistic* setting
  - Coding systems
  - Equipment
    - e.g., videotape; audiotape
  - Methodological issues
    - Reactivity – Presence of observer
    - Reliability – Coding system may be biased
    - Sampling – Hard to find a large sample

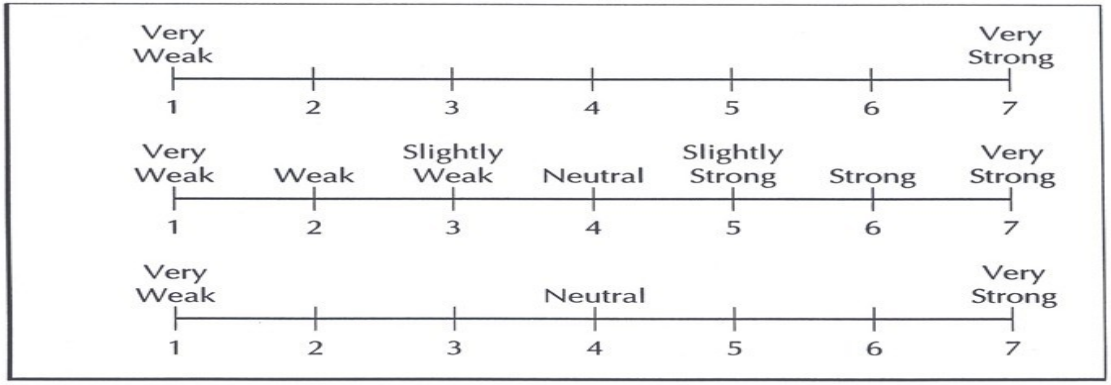
Question wording examples

- *Simplicity*
- Have you or your relatives had a myocardial infarction?
- *Double barreled questions*
- Should senior citizens be given more money for recreation centers and food assistance programs?
- *Loaded questions*
- Do you favor eliminating the wasteful excesses in the public school budget?
- Do you favor reducing the public school budget?
- *Negative wording*
- Do you feel that the city should not approve the proposed women's shelter?

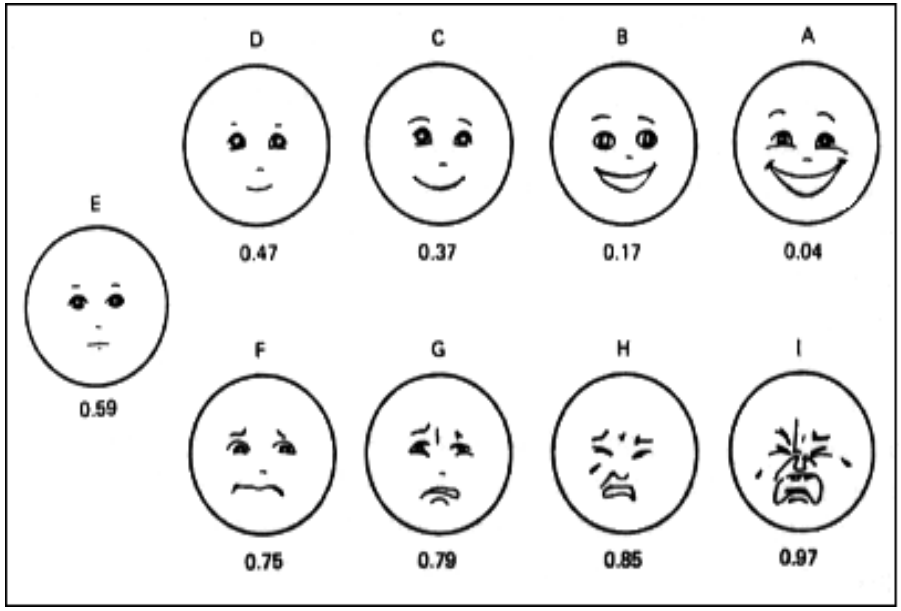
Responses to questions

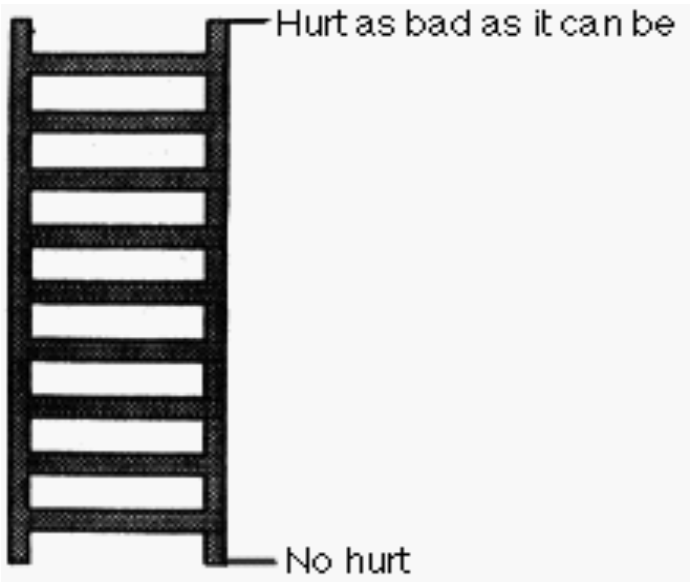
- Closed vs. open-ended responses

- Closed-ended responses
  - Yes/no or nominal vs. scale
  - Likert/rating scale
    - Restriction of range (1 to 3 vs. 1 to 10 response)



Nonverbal Scales





Probability sampling

- Simple random sampling
  - Every member of population has equal opportunity of being selected for the sample
- Stratified random
  - Control for particular variables to ensure they are equal across groups
- Cluster sampling
  - Identify clusters and then randomly sample from cluster

Nonprobability sampling

- Haphazard sampling
  - "convenience"
  - Take them where you find them
- Purposive sampling
  - Sample meets certain criterion
- Quota sampling
  - Certain percentage of subgroups

Evaluating Samples

- Sampling frame
  - What you sample vs. actual population of interest
- Response rate
  - How do responders differ from non-responders?

Convenience Samples

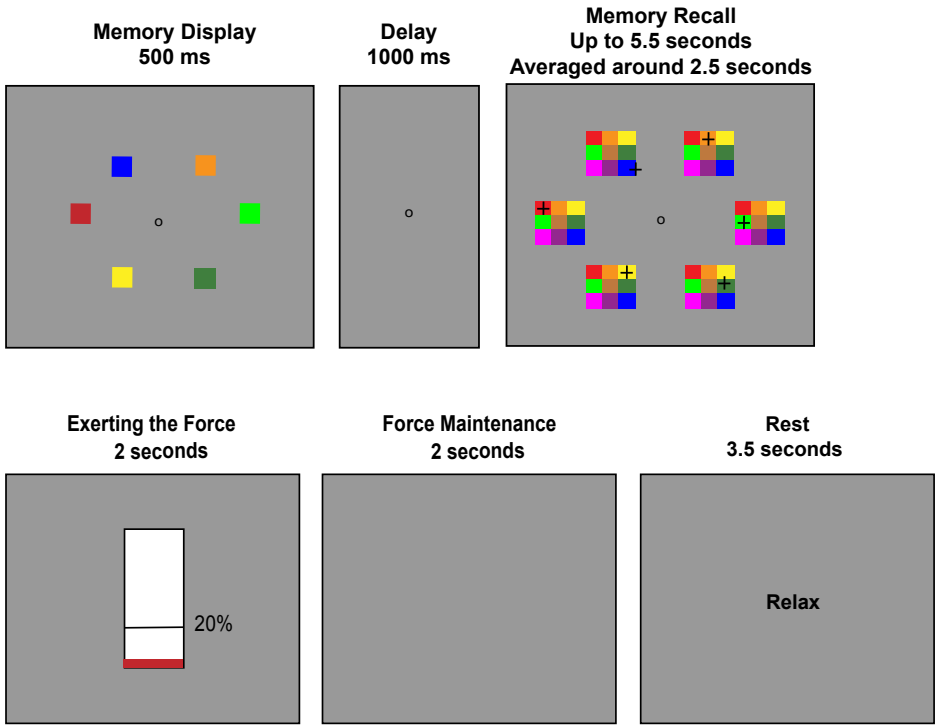
aka Nonprobability sampling

- Assess representativeness of sample
- Cost and time trade-offs
- Relationships between variables vs. estimating population values

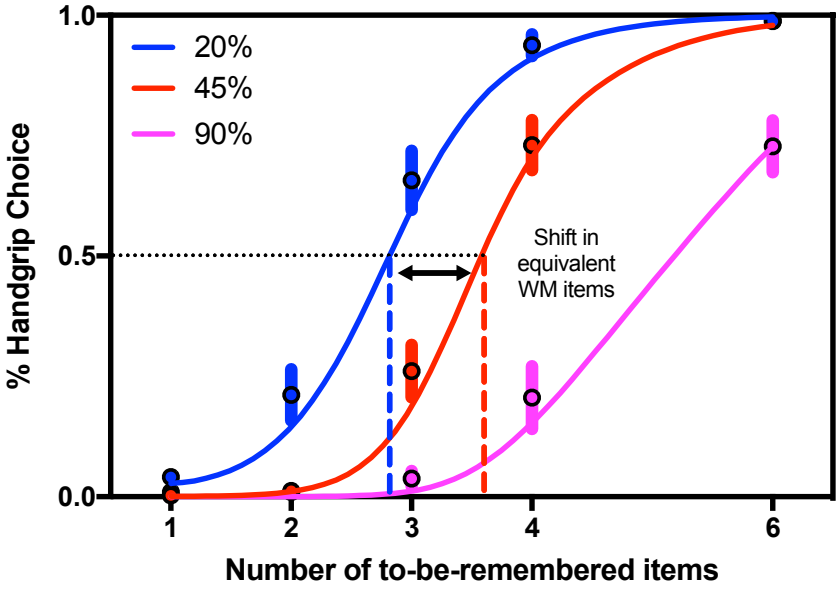
Think, pair, share

- *What is the relationship between physical effort and cognitive processing?*
- i.e. if you are straining to do something physical, is this the same as straining to do something mental?
  - Define your sample!
  - Methods
    - Operational definition
  - Confounds

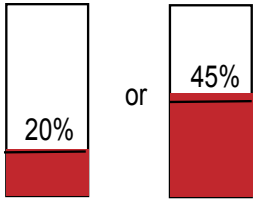
Exp1b: Experience-based decision



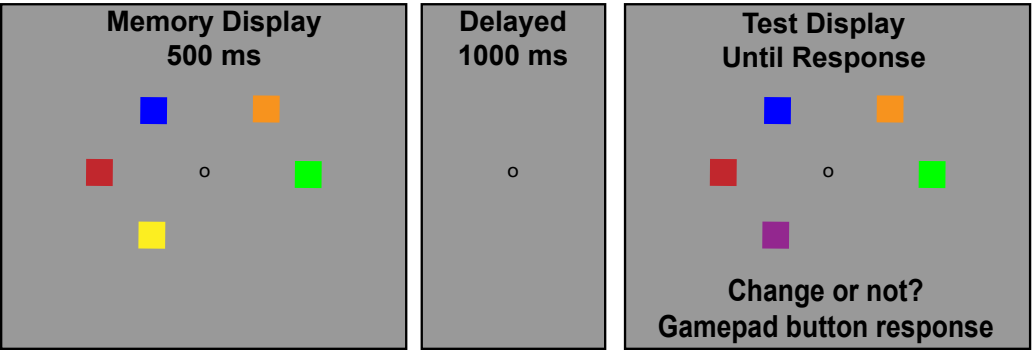
Try both tasks, and choose which one is more "effortful"

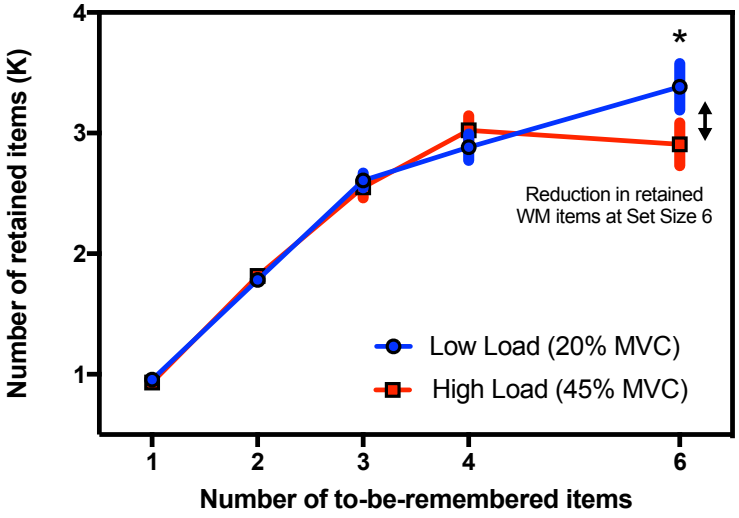


Exp2. Direct competition between physical effort and mental effort



Continuously monitoring of force maintenance





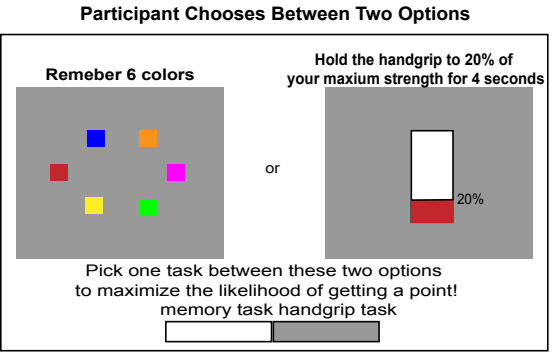
Concurrent physical effort reduces the number retained WM items.

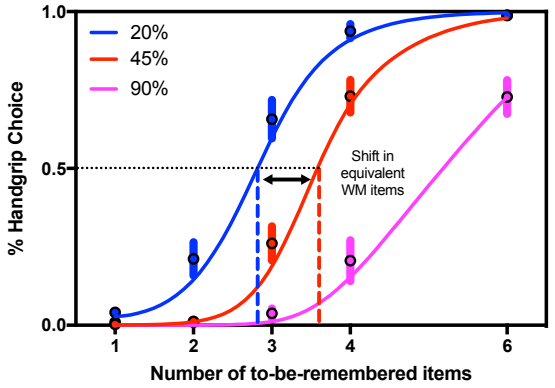
Issue: are these two experiments measuring the same thing?

1. *You choose which is more difficult*
2. *You do both concurrently*

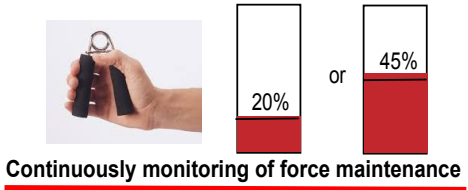
Correlation!

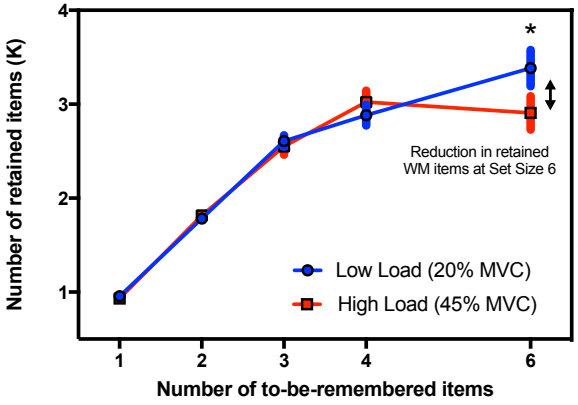
Session1

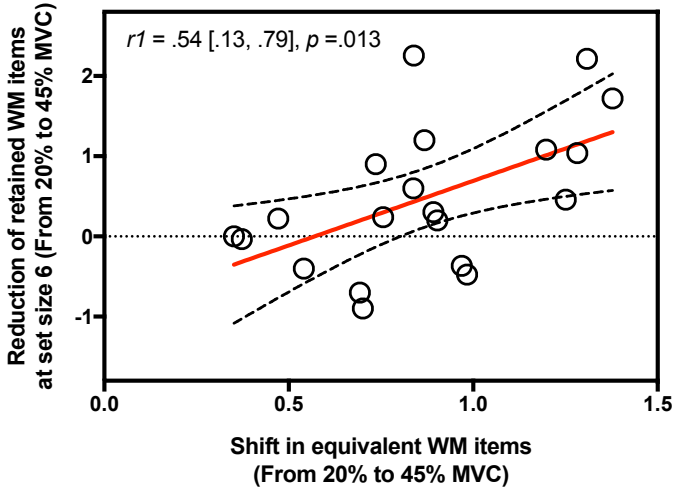


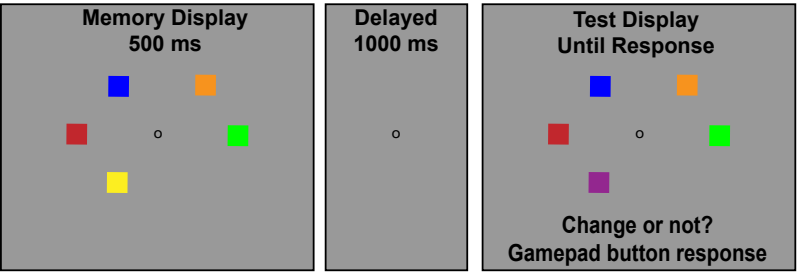


Session2&3









Concurrent physical effort reduces the number retained WM items.

Things to think about

- Participant exhaustion
  - Make the task easy enough to complete
  - Add rewards
- Try to answer questions from multiple angles
  - Self reflection and concurrent action
  - Future: fMRI